1969 - 1970

REPORT NO. 86
DECEMBER 1970

CENTER FOR DISEASE CONTROL

INFLUENZA - RESPIRATORY DISEASE SURVEILLANCE

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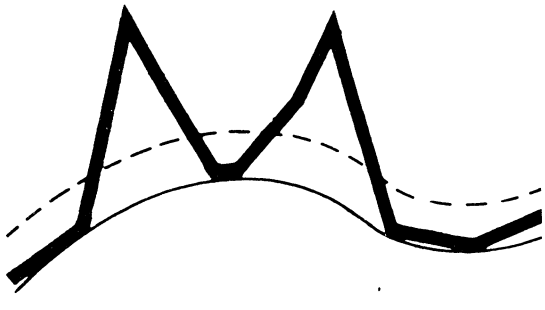

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

PREFACE

Summarized in this report is information received from State Health Departments and other pertinent sources, domestic and foreign. Some of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the surveillance report are most welcome. Please address to:

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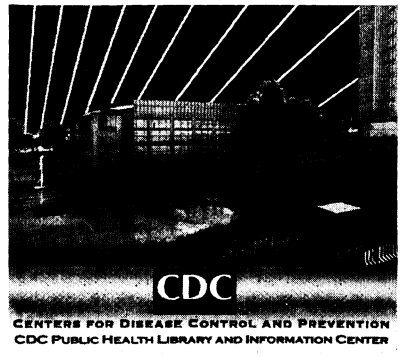

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INTRODUCTION

Throughout the year the Respiratory Diseases Surveillance Unit keeps a close watch on the occurrence and spread of influenza in the United States and throughout the world. In an attempt to obtain as broad based a picture as possible of the spread of influenza, information is collected from a number of sources representing a variety of different viewpoints. These sources and their respective data are summarized in this report for the 1969-70 season.

I. SURVEILLANCE SUMMARY

A. General Data

Through periodic telephone surveys to state epidemiologists and health officials, specific information was obtained regarding the presence of influenza, its location, extent and severity. Although rigorously accurate statistical data were generally not available, this type of information does give a broad overall picture of the spread of the disease.

After the widespread influenza outbreaks in the United States in 1968-69 (see Influenza Surveillance Report #85, June 30, 1969), activity in the 1969-70 season was decidedly less extensive, although considerably more activity was encountered than expected. Even though 48 of the 50 states reported influenza in 1969-70 as compared with all 50 states in the preceding season, only six states reported widespread activity as compared with 44 the preceding season.

Influenza was first reported in the United States during the 1969-70 season in Alaska in early November with sporadic regional outbreaks occurring in that state in November, December and January. Scattered outbreaks also occurred in Puerto Rico in late November. The next state to report a significant outbreak was Vermont where regional outbreaks* occurred in January.

In late January and February significant activity began to occur along the East Coast and in the Southeast. Also in late January isolated outbreaks were documented in Oregon, Washington and Hawaii. By early February significant rises in influenza and influenza-like illness were being noted in the East North Central and East South Central areas as well as in scattered areas throughout the rest of the county. Some of the Mountain States noted peak activity during late February and March. Although there seemed to be a progression of illness from the East Coast westward, most states that encountered increased levels of illness dated peak illness levels within a relatively circumscribed period of time between January 24 and February 28 (Figure 1). This is considerably later than the experience in the 1968-69 season when the illness had reached its peak in most states by early January.

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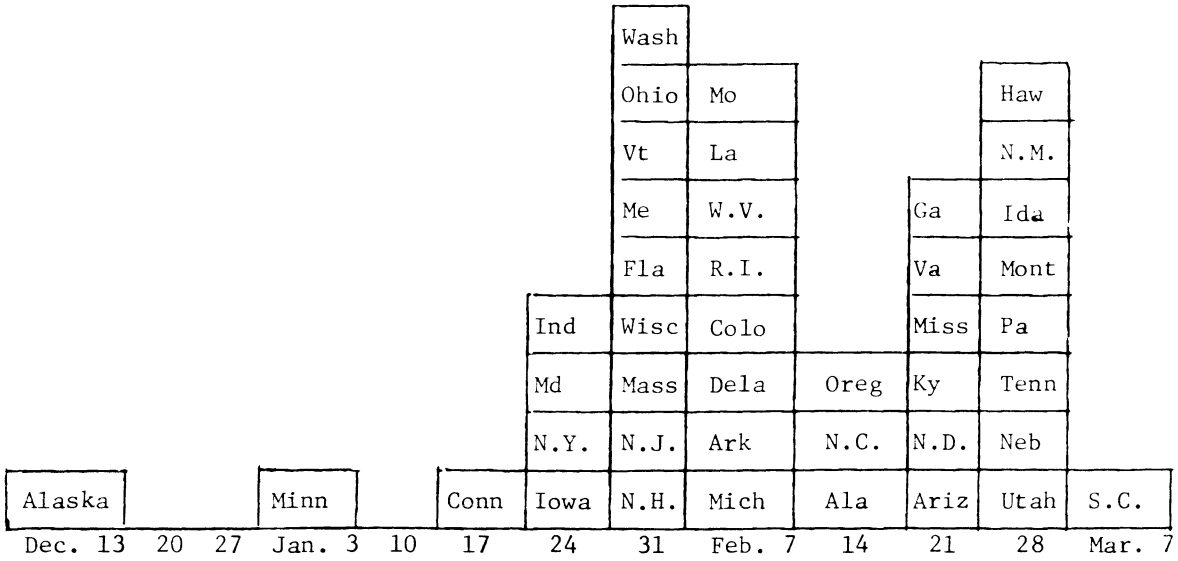
*Influenza extent categories:
(1) Isolated Cases
(2) Isolated outbreaks
(3) Regional involvement-outbreaks recognized in contiguous counties but altogether involving counties comprising less than one-half of a state's population.
(4) Widespread involvement - outbreaks recognized in more than one-half of the counties or in counties comprising more than one-half of a state's population.

Figure 1

APPROXIMATE WEEK OF PEAK ACTIVITY FOR STATES REPORTING OUTBREAKS OF INFLUENZA

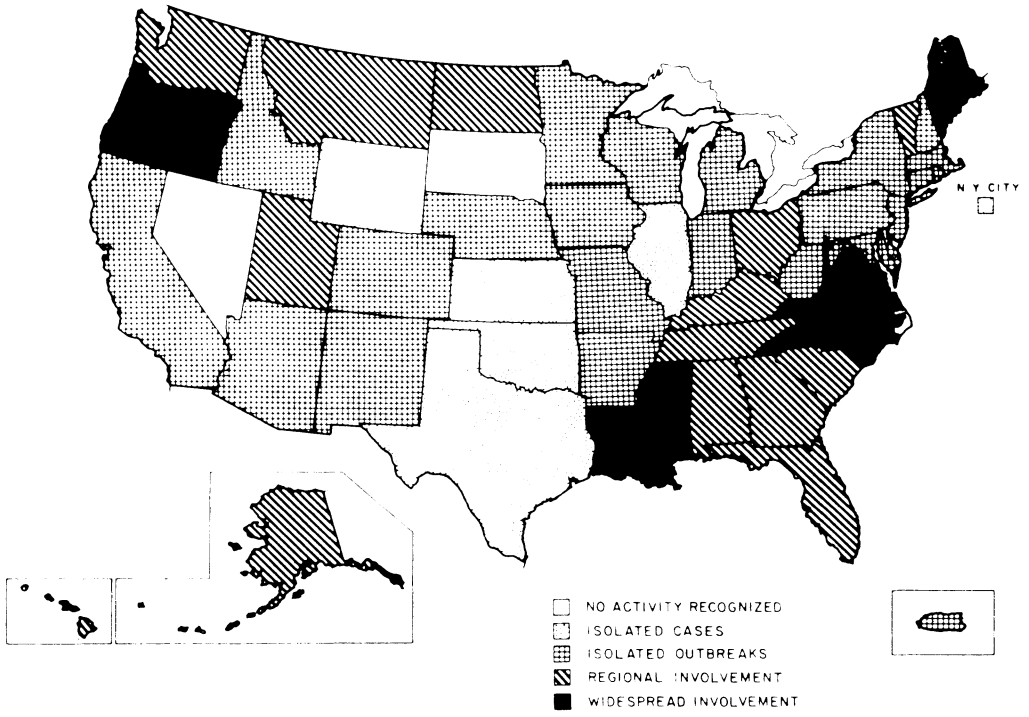


The areas most heavily involved in 1969-70 were along the East Coast, in the South-east and the Pacific Northwest (Figure 2). The Mid-West and Mountain areas were relatively less involved although a number of significant outbreaks were also noted in these areas. It should be noted, however, that a striking feature of the spread of influenza was the appearance of a rather "hop-scotch" pattern of involvement with adjacent states and even adjacent counties noting markedly different attack rates.

Widespread influenza activity was noted in Maine, North Carolina, Virginia, Mississippi, Louisiana and Oregon. All of these areas except Mississippi had significant activity the preceding season. Regional activity was noted in 14 states, and isolated outbreaks were documented in 23 states (Figure 2) . In five states only isolated cases were noted, and in two states no cases were reported.

Although accurate statistical data are generally not available, the reports from state health departments indicate a number of characteristic features of influenza in 1969-70. In comparison with the 1968-69 season, the outbreaks in 1969-70 were much more localized even in those states reporting widespread and regional activity with the population groups affected tending to be smaller and more scattered. Reports from the few large metropolitan areas affected indicated that the illness seemed to be localized in circumscribed sectors or areas rather than over widespread areas. The larger urban centers were frequently spared in 1969-70, whereas the preceding season most were heavily involved. In a number of instances, communities not affected in 1968-69 were heavily involved in 1969-70, and some significantly involved during the first season in 1968-69 were spared in 1969-70. However, many communities were affected both years.

Figure 2
INFLUENZA, OCTOBER 1969 — MARCH 14, 1970



Many of the states reported that the population affected in 1969-70 was somewhat older than that of the preceding year in that high schools tended to have higher absentee rates than junior high or elementary schools. Schools in at least seven states had to close because of teacher absenteeism.

B. Mortality Statistics

Pneumonia-influenza deaths from 122 United States cities are carefully monitored each week for trends in the country as a whole as well as in each of the nine major geographic regions. These data are thought to be the most accurate reflection of the severity and extent of an epidemic available (see Influenza Surveillance Report #84).

The pneumonia-influenza mortality curves were first noted to be elevated above expected levels during the first week in 1970 and remained elevated through the 9th week (the week ending 3/14/70, Figure 3). The curve was only modestly elevated above the baseline even at its highest level. In marked contrast is the curve from 1968-69 which is much steeper and broader based. The mortality pattern closely mirrored the reported outbreaks with the New England, Middle Atlantic and South Atlantic regions having the most notable increases in morbidity. The East North Central, East South Central, and West South Central regions had elevations of a lesser degree and the West North Central, Mountain and Pacific areas had only minimal unsustained fluctuations above the baseline levels. Deaths from all causes showed a similar pattern but with much greater fluctuation (Figure 4).

Figure 3

PNEUMONIA-INFLUENZA DEATHS IN 122 UNITED STATES CITIES

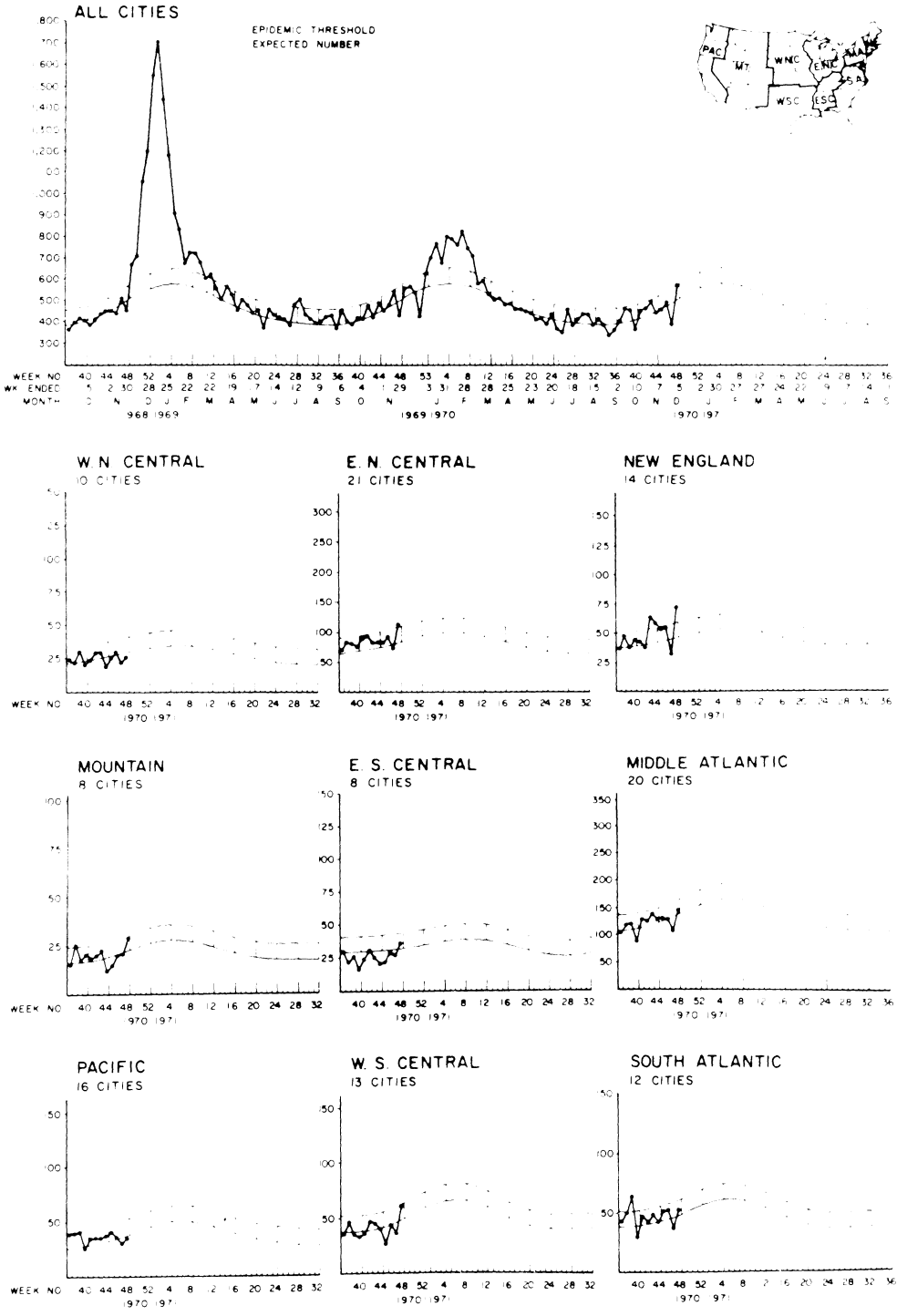


Figure 4

MORTALITY IN 122 UNITED STATES CITIES

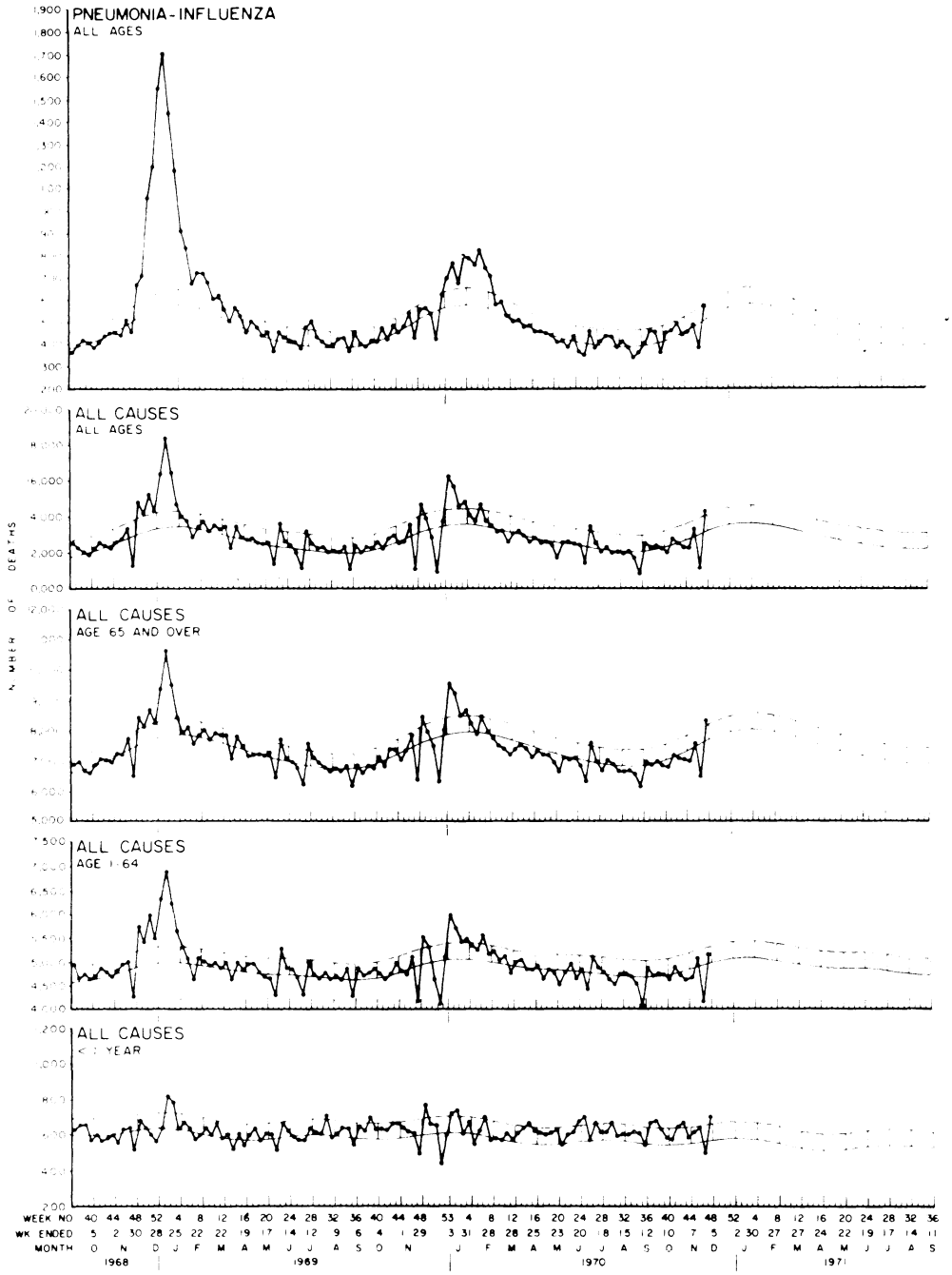


Table 1 gives a summary of the excess mortality during the periods of epidemic influenza during the past 2 years. If one assumes that the 122 United States cities in the reporting system represent approximately 1/3 of the total United States population, then the total excess mortality for the 1968-69 season can be estimated to have been over 58,000 with over 27,000 deaths during the subsequent season (by multiplying the observed excess by a factor of 3). It should be emphasized that these figures are merely rough estimates since the population base is almost exclusively urban in nature and extrapolations to populations in less congested areas may not be valid. Final data from death certificates will not be available for several years.

Table 1

PNEUMONIA-INFLUENZA AND TOTAL MORTALITY FIGURES FROM 122 U.S. CITIES DURING EPIDEMIC INFLUENZA PERIODS IN 1968-69 AND 1969-70

Years	Mortality Category	Observed	Expected	Excess
1968-69 (weeks 49-12)	Pneumonia and Influenza	13211	6086	7125
	Total	232108	212674	19434
1969-70 (weeks 1-8)	Pneumonia and Influenza	6004	4571	1433
	Total	117458	108255	9203

C. Analysis of State Influenza and Respiratory Disease Reports

Another source of data is the 25 states that report respiratory illness on a regular basis in their state health bulletins. These data are presented in Table 2 by 2-week periods or by month, depending upon the reporting system, and are plotted for nine states in Figure 5. Since the criteria for reporting as well as its sensitivity and specificity vary so much from state to state, actual numbers cannot be compared. However, the shapes of the curves and seasonal distribution are comparable. Since the Influenza A virus was prevalent for only several months last year, and since cases are reported year round in most states, much of what is reported under the heading of influenza is probably non-specific upper respiratory illness. Despite the obvious limitations of this type of data, several trends seem apparent and merit consideration.

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TABLE 2

REPORTED CASES OF INFLUENZA AND UPPER RESPIRATORY ILLNESS
1969–1970

STATE	Type of Illness Reported	Aug. 9	Aug. 23	Sept. 6	Sept. 20	Oct. 4	Oct. 18	Nov. 1	Nov. 15	Nov. 29	Dec. 13	Dec. 27	Jan. 10	Jan. 24	Feb. 7	Feb. 21	Mar. 7	Mar. 21	Apr. 4	Apr. 18	May 2	May 16	May 30	June 13	June 27	July 11	July 25	TOTAL
Alabama	Influenza	14	3	7	23	34	69	21	99	80	79	10	22	975	12,655	17,997	4,736	490	51	70	21	4	7	1	19	5	1	37,493
Alaska	Influenza		14		58		393			511		1,078		1,271		1,001		48		111			136		37		14	4,672
Arizona																											
1969-70	Influenza	230	119	143	118	188	316	269	424	350	486	627	463	844	1,487	1,730	2,073	1,704	955	678	263	300	306	153	218	126	191	14,761
5-Yr. Median		147	137	175	208	255	361	456	646	527	668	627	835	922	1,282	875	1,384	1,124	628	631	473	454	299	228	166	152	125	13,685
1969-70	Acute Respiratory Disease	1,113	1,255	1,357	1,358	2,184	2,303	2,396	3,089	3,150	3,093	3,604	2,823	4,147	4,264	4,106	3,626	3,571	3,068	2,797	2,034	3,045	1,895	1,673	1,529	1,326	1,348	66,249
5-Yr. Median		1,145	920	1,108	1,433	1,959	2,138	2,349	2,477	2,319	3,336	3,185	3,125	4,025	4,141	3,112	2,982	3,286	2,900	2,875	2,301	2,349	1,847	1,748	1,378	1,060	1,266	60,764
Connecticut	Influenza	0	0	0	0	0	0	0	0	0	12	10	20	130	34	59	115	20	6	3	1	0	0	2	2	3	6	423
Delaware	Influenza	0	0	1	0	0	0	0	0	0	3	1	307	344	200	91	85	5	1	4	1	0	1	3	3	6	1	1,057
Florida	Influenza		20	37	29	52	64	78	58	718	499	627	1,149	2,821	7,570	13,066	1,861	5,832	585	226	1,308	254	254	136	99	49	122	38,244
Hawaii	Influenza		20		28		26			53		89		105		269		595		145			57		34		22	1,443
5-Yr. Median			16		22		41			41		91		150		190		218		63			46		34		19	931
Idaho	Influenza					134	264	196	216	224	108	123	362	296	596	1,616	1,948	1,243	512	318	317	186	168	151	109	73	100	9,260
URI	Viral URI					555	529	1,029	737	927	852	490	1,388	978	878	913	1,108	934	742	507	870	723	598	394	430	130	262	15,979
Indiana	Influenza	103	188	133	312	408	328	318	450	628	736	810	648	934	2,336	7,798	5,141	2,000	725	589	436	298	237	187	134	105	41	26,023
Kentucky	Influenza-like	20	61	95	200	227	129	269	275	170	338	337	222	614	5,186	9,586	11,971	3,675	545	300	212	357	30	19	61	0	88	34,987
Mississippi	Influenza	0	0	0	0	0	0	0	0	0	0	0	0	129	1,352	8,608	3,419	252	4	45	5	1	5	2	4	0	0	13,826
Montana	Influenza	23	14	34	13	9	54	71	71	75	56	88	93	169	229	967	1,105	365	177	145	90	63	28	30	23	23	20	4,035
New Mexico	Influenza	27	51	86	140	278	324	368	148	366	569	434	498	307	2,316	2,039	4,237	1,383	845	328	324	250	159	81	44	0	0	15,602
North Dakota	Influenza and Influenza-like	20	115	136	152	172	183	177	188	182	258	143	142	142	399	465	756	244	207	319	211	58	43	51	26	20	33	4,842
Ohio	Influenza	4	3	5	16	9	38	0	52	51	129	16	83	1	37	417	829	691	340	216	30	104	22	29	19	37	19	3,197
Oregon	Influenza	163	126	121	229	356	556	639	602	643	963	856	1,036	2,286	6,948	12,244	9,295	3,853	1,995	1,003	718	616	470	394	200	169	150	46,631
Rhode Island	Influenza-like		12		3		9			9		46		524		810		76		26			15		15		3	1,548
South Carolina	Influenza	5	74	2	72	35	148	117	41	82	210	165	249	384	1,464	5,299	10,338	1,626	391	354	178	121	135	51	106	52	14	21,713
Tennessee	Influenza		1,023		1,220		2,351			3,108		3,204		6,615		66,414		35,872		5,204			1,785		780		598	128,174
Texas	Influenza and Influenza-like	503	407	515	905	1,367	1,164	1,905	2,512	2,444	3,420	2,457	5,656	21,039	36,516	9,148	9,595	4,305	1,992	1,623	1,316	1,012	902	1,039	1,086	645	718	114,191
Utah	Influenza	11	64	22	34	11	38	80	49	85	95	41	63	240	85	145	2,278	906	205	108	75	42	64	0	30	0	7	4,778
Vermont	Influenza	0	0	0	0	0	0	0	0	0	0	0	310	487	696	12	110	0	0	0	0	0	0	0	0	0	0	1,615
Virginia	Influenza											185	1,113	850	5,434	7,196	2,819	1,544	523	262	110	106	8	22	34	40	374	20,620
Washington	Epidemic Respiratory Infection and Influenza		219		148		4,677			20,256		14,998		31,249		36,104		16,691		15,591			15,558		2,682		194	158,359
West Virginia	Febrile Upper Respiratory Infection	1,256	953	1,129	2,344	3,487	3,087	4,147	4,057	4,517	5,632	3,604	4,710	9,674	23,778	22,712	14,046	7,833	4,086	3,457	2,963	3,238	1,831	1,523	853	1,026	1,167	137,100

Figure 5 REPORTED INFLUENZA CASES IN REPRESENTATIVE STATES, 1969-1970

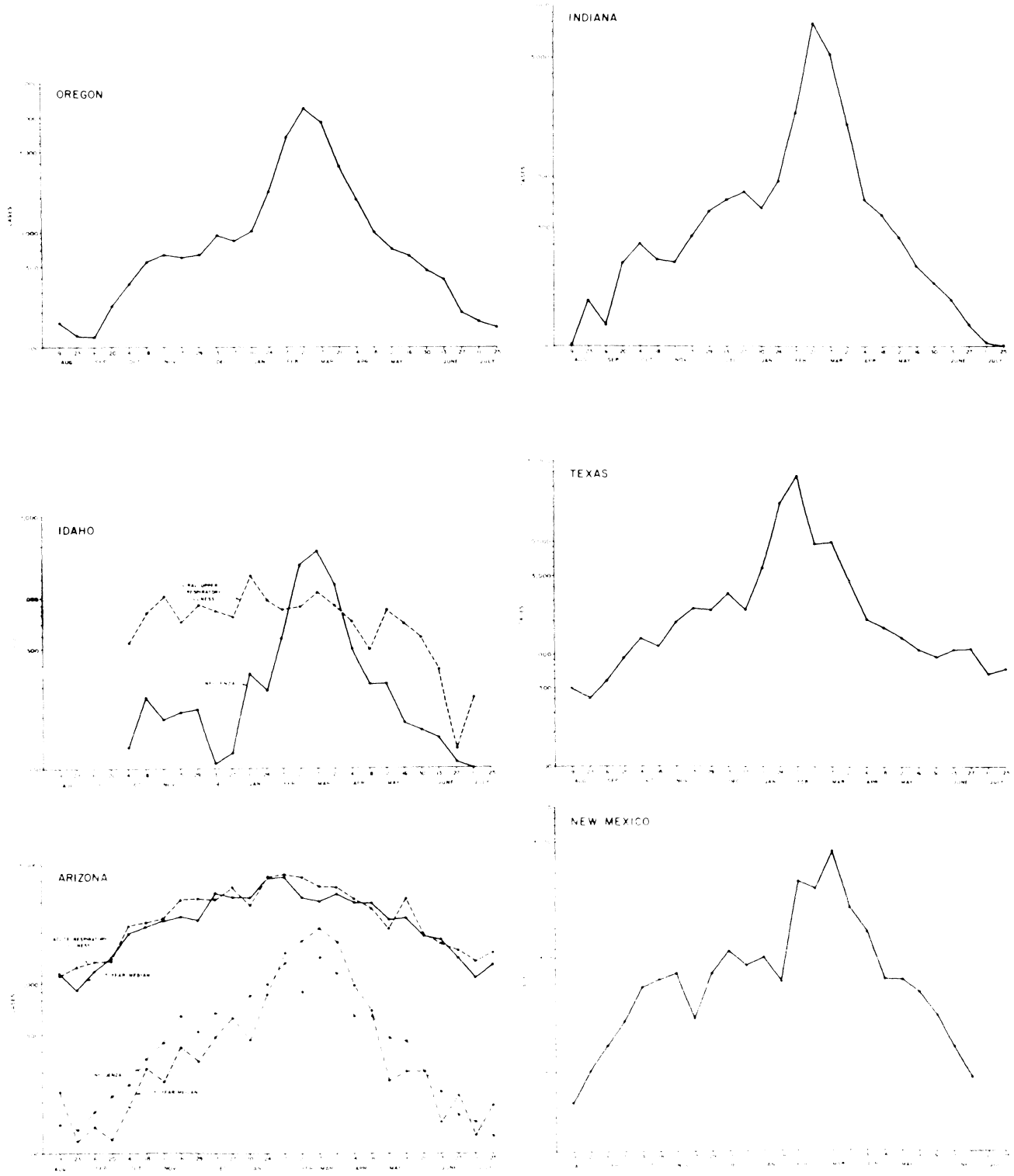
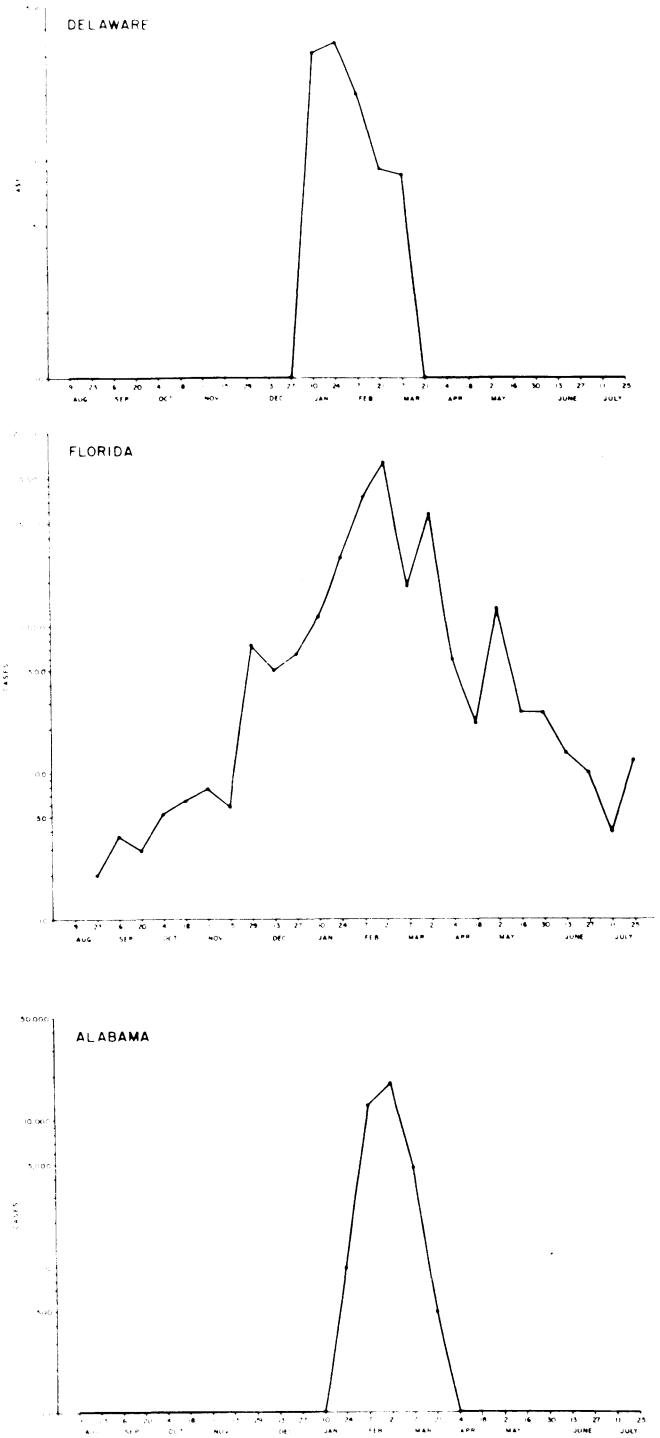


Figure 5 (CONT)
REPORTED INFLUENZA CASES IN REPRESENTATIVE STATES, 1969-1970



1. Although the disease peaked in each state between early January and mid-March, East Coast states tended to have earlier peaks (in January and February) while disease in the other states tended to peak. somewhat later (in February and March). This was particularly noticeable in the Mountain Division states of Montana, Idaho and Arizona. An exception was South Carolina where the disease peaked late also.

2. It is also apparent from these data that many of the states showed relatively low but significant levels of respiratory illness in the summer months, with cases generally rising approximately tenfold in the autumn. This probably relates to the re-opening of schools in September. Another approximate tenfold rise was seen during the period of time when influenza was known to be prevalent, suggesting that the actual peak of reported respiratory illness may in fact be composed primarily of true cases of influenza, only 10 to 15 percent of which is due to the usual winter background of respiratory illness. The semi-log plots tend to underemphasize the magnitude of the peaks in relation to the baseline. In several states small or even no peaks were noted, corresponding with the absence of known significant influenza activity reported from other sources. Levels in spring were equivalent to those in fall.

3. A somewhat different type of reporting system is evident from the data for the states of Delaware and Alabama. Cases were reported only during the periods of time when the influenza virus was being isolated in this country. The epidemic curves in these states indicate rather striking and sharply demarkated epidemics (the data for Connecticut, Vermont and Mississippi are similar in this regard). Again care must be exercised in interpreting the actual numbers. Although an epidemic "scare" can increase reporting markedly, this probably only accentuates the shape of the curve with the number of reported cases probably representing only the "top of the iceberg".

4. Lastly, two states, Arizona and Idaho, give a somewhat more detailed breakdown of their data. For Arizona influenza and acute respiratory disease (causes undetermined) are plotted separately with their respective 5-year medians. A 35 to 50 percent rise above the 5-year median is seen for influenza, corresponding with the fact that only isolated outbreaks of illness were observed. The acute respiratory illness curve shows no peak, and also indicates less seasonal variation. In Idaho, the peak of influenza activity in late January through mid-April is in marked contrast to the relatively uniform rate throughout the fall, winter and spring months for other upper respiratory illness.

D. State Laboratory Reports

Several state laboratories publish a detailed breakdown of their influenza data. This type of data gives another different, and enlightening viewpoint.

In Figure 6 serologic and virologic influenza A2 confirmations at California State Laboratories are shown by week of report. California reported only isolated outbreaks in 1969-70 and had a total of 19 isolations and 203 seroconversions. The peak for seroconversions was during March, with most of the isolations in the first quarter of 1970. This illustrates the well accepted fact that the presence of virus does not necessarily mean epidemic levels of illness.

Figure 6 SEROLOGIC AND VIROLOGIC CONFIRMATIONS OF A_2 INFLUENZA, BY TWO-WEEK PERIODS, CALIFORNIA, 1969-1970

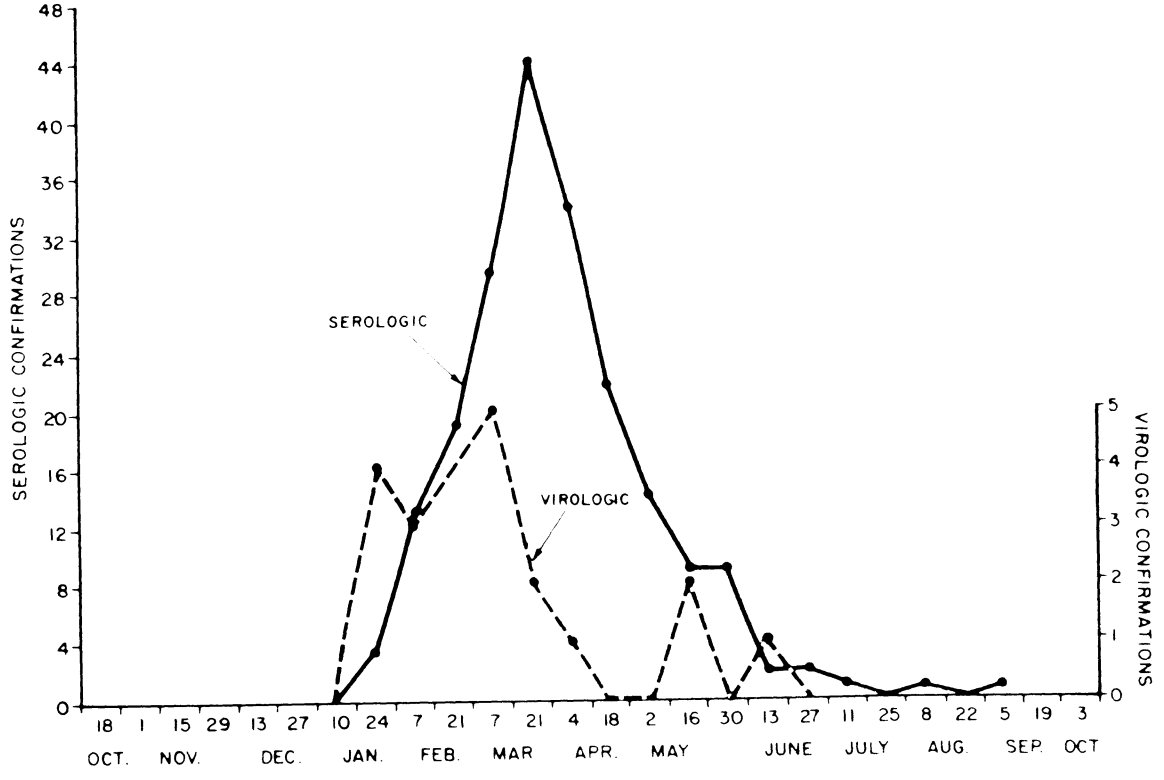


Table 3 gives the results of the New York State Laboratory respiratory virus survey and indicates that the rate of positivity rose from a baseline level of 8 to 15 percent to a high of 45 percent in February, indicating a significant rise in the number of persons exposed to illness even though New York State reported only isolated outbreaks. That these data were derived from sera of persons submitting blood for STS determinations must be kept in mind in evaluating any conclusions drawn.

Table 3

NEW YORK STATE LABORATORY RESPIRATORY VIRUS SURVEY

Month	Influenza A			Influenza B
	Routine Sera Percent Positive	Sero Conversions	Isolations	Routine Sera Percent Positive
1968 Oct.	7.5	1	0	0
Nov.	8.8	4	0	1.2
Dec.	40.0	57	12	2.5
1969 Jan.	36.2	6	3	0
Feb.	26.2	0	0	2.5
Mar.	25.0	3	0	6.2
Apr.	31.2	0	0	3.8
May	21.2	2	0	1.2
June	12.5	0	0	2.5
July	20.0	0	0	0
Aug.	11.2	0	0	2.5
Sept.	8.8	0	0	2.5
Oct.	13.8	1	0	1.2
Nov.	15.0	3	0	2.5
Dec.	22.5	2	0	1.2
1970 Jan.	22.5	16	5	5.0
Feb.	45.0	18	1	3.8
Mar.	38.8	1	0	0
Apr.	20.0	0	0	1.2
May	31.2	0	0	3.8
June	25.0	0	0	1.2
July	27.5	0	0	5.0

Table 4 shows similarly derived data from New York City. Several features deserve comment:

1. The relatively uniform rate of positivity in all age groups is quite striking and tends to support the contention that age specific attack rates were relatively uniform during the Hong Kong era. However, data for ages 15 and below were not available.

2. Although a titer of 1:8 is relatively non-specific, the high percentage of persons with such titers at the beginning of the season suggests that this population had already had extensive previous experience with this virus and may account for the absence of major outbreaks during 1969-70 in New York City.

3. However, the slight rise in rates of sero-positivity during the 1969-70 season indicates that the virus was circulating in the population at least at a low level.

Table 4

NEW YORK CITY RESPIRATORY VIRUS SERUM SURVEILLANCE
A2 HONG KONG INFLUENZA

Age Group	Serum Dilution	Percent Positive Reactions*						
		Dec	Jan	Feb	Mar	Apr	May	June
15-19	8	70	78	78	94	72	60	70
	32	24	38	47	32	34	30	28
20-29	8	72	68	86	94	72	54	68
	32	20	12	40	24	28	12	30
30-39	8	66	86	80	92	84	64	76
	32	26	30	28	20	28	16	34
40-49	8	78	88	90	76	76	60	78
	32	30	32	40	14	20	12	32
50-59	8	60	74	80	74	74	66	66
	32	36	38	30	14	20	16	22
60+	8	62	68	74	88	74	56	72
	32	30	24	36	20	22	22	32
All Ages	8	67.0	77.0	81	86.3	75.3	60	71.7
	32	27.7	29.0	37	22.3	25.3	18	29.7

*Sera from apparently healthy persons (Wasserman applicants); 50 in each age range.

E. Speculations and Outlook

Based upon knowledge of the usual 2 to 3-year cyclic pattern for influenza A virus and the experience that a major epidemic season has been routinely followed by a quiet season, the significant influenza activity during the 1969-70 season was unexpected. One might speculate that the 1969-70 experience was a phenomenon similar to the second wave of 1957-58 but with the second peak occurring a year later rather than a month later. If the overall attack rate during the first Hong Kong season was only about 25 percent, then large numbers of susceptibles would have remained during the second season. It is possible that two waves of illness due to a new strain are necessary to provide enough community immunity to prevent epidemic spread. Our lack of understanding in such matters has been underscored by these recent events.

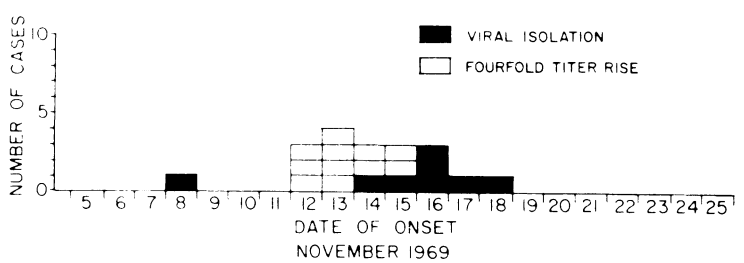
Epidemic influenza has now occurred in three successive years in this country, a situation which is without known epidemiologic precedent and which leaves a great deal of uncertainty regarding 1970-71 season. Since periods with widespread epidemic activity are generally followed by periods with only minimal or low level activity, since there has been no evidence of antigenic change in the currently prevalent Hong Kong A2 strain, and since many individuals have been exposed over the past 2 seasons, major outbreaks of influenza A seem relatively unlikely this coming season. However, it must be emphasized that since influenza A has a 2 to 3-year cyclic pattern and the Hong Kong A2 strain has now been prevalent for 2 years, changes of epidemiologic significance in the antigenic make-up of the virus may occur at any time. In addition, influenza B which has a 4 to 6-year cyclic pattern has not occurred in many areas of the country in 4 to 5 years, thus, activity due to this variant would not be unexpected.

II. SUPPLEMENTARY REPORTS

A. Hong Kong Influenza - Anchorage, Alaska

In mid-November 1969, an outbreak of influenza occurred in a church-supported residence for children with behavioral disorders and affected 28 of the 65 residents and staff. Investigation revealed that the cases began as early as November 8 with most occurring between November 12 and 18 (Figure 7). A2 Hong Kong-like viruses were isolated from eight individuals, and 17 showed fourfold or greater titer rises. A total of 19 cases were confirmed by viral isolation and/or serology. Eight of the cases were staff members (out of 25) and 11 were children (out of 40). The age of the patients ranged from 8 to 51. The most common signs and symptoms were cough, malaise, fever, and rhinitis. One case of pneumonia and two cases of post-influenza asthenia occurred.

FIGURE 7
ONSET OF ILLNESS IN 19 PERSONS WITH
CONFIRMED A2/ALASKA/69 INFECTION
IN A CHILDREN'S HOME, ANCHORAGE, ALASKA



This was the first confirmed outbreak in the continental United States in 1969-70. During the months of November and December there was an increase in the incidence of influenza-like illness with increased absenteeism in schools and businesses in the Anchorage area. Influenza virus similar to that of the children's home was isolated from four other sick individuals in the area in November. Outbreaks of influenza-like illness associated with significant school absenteeism occurred in Ketchikan and Sitka in southeastern Alaska in February 1970, and there appeared to have been a progression of activity from the Anchorage area to other population centers and from there to more rural areas. Major influenza activity in Alaska preceded that in the rest of the continental United States by about 1 month. The cause of this difference in timing is not clear.

(Reported by: Arnold R. Saslow, Senior Assistant Health Services Officer, and T. Stephen Jones, M.D., EIS Officer in Alaska, and state and local health officials)

B. Hong Kong Influenza - Homer, Alaska

An outbreak of A2 influenza between mid-November and mid-December was investigated in Homer, Alaska, which involved 128 persons. Homer, a town of approximately 2,500 people located 250 miles south of Anchorage, is predominantly dependent upon the tourist and fishing industries. A total of 128 cases of influenza were reported between November 17 and December 27, 1969. Sixty-eight of these were seen by a physician and 60 were diagnosed by telephone interview. The largest number of cases was seen in the 10 to 14 age range with about 40 percent occurring in school age persons (Table 5). The peak of the outbreak occurred between November 29 and December 3 (Figure 8). School absenteeism was between 10 and 15 percent compared with an estimated 25 to 30 percent in the 1968-69 influenza outbreak. Of 128 cases only 12 percent (15) gave a history of influenza-like illness in 1968-69.

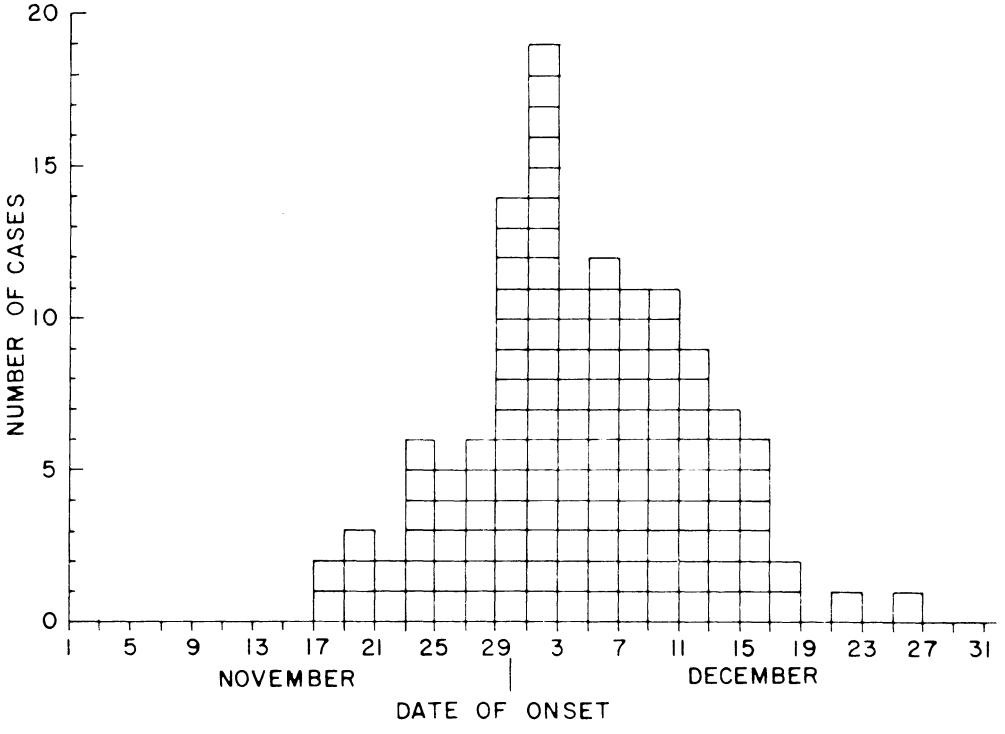
Table 5

AGE AND SEX DISTRIBUTION OF 68 INFLUENZA CASES
HOMER, ALASKA - NOVEMBER-DECEMBER 1969

Age (Years)	Male	Female	Total	Percent
0-4	3	2	5	7.4
5-9	3	4	7	10.3
10-14	4	8	12	17.6
15-19	1	3	4	5.8
20-24	4	1	5	7.4
25-29	2	3	5	7.4
30-34	2	5	7	10.3
35-39	3	4	7	10.3
40+	7	9	16	23.5
TOTAL	29	39	68*	100.0

*Sixty of the 128 cases were diagnosed by telephone contact, and no age was obtained.

FIGURE 8
DISTRIBUTION OF 128 INFLUENZA CASES
BY 2-DAY INTERVAL OF ONSET
HOMER, ALASKA, NOVEMBER-DECEMBER 1969



The characteristic clinical picture consisted of fever, cough, headache, myalgia, sore throat and rhinorrhea. Duration of illness ranged between 2 and 10 days with a median of about 6 days. Secondary pneumonia developed in five cases. Serous otitis media was seen in four or five cases complaining of earache. No other complications were noted, and no deaths were reported.

A2 Hong Kong-like virus was isolated from four of ten throat swabs. Two fourfold rises in antibody titer were also documented. In a virus shedding study involving a total of 39 persons in four families and a small boarding school it was demonstrated that the virus was shed from 1 day before to 6 days after the onset of illness, with highest percentage of positive cultures from the time of onset to 3 days later. Five persons in the study who had no influenza symptoms developed evidence of carrier status (two had virus isolations and three had serologic rises).

The influenza virus was probably imported from Anchorage by relatives who came in contact with the families during the Thanksgiving holidays. Cases were being reported and confirmed in Anchorage in early November and such contact could logically have spread the virus.

A number of neighboring communities not affected in 1968-69 were affected in 1969-70. Anchor Point and Ninilchick reported high illness rates with school absenteeism reaching 40 to 50 percent. In contrast, other neighboring communities of English Bay, Seldovia and Port Graham which reported high attack rates in 1968-69 had few cases during the 1969-70 season.

(Reported by Paul Clark, M.D., Chief Alaska Activities, Ecological Investigations Program, and Gary J. Kaplan, M.D., Medical Epidemiologist, and state and local health officers)

III. INTERNATIONAL NOTES

The current epidemic of A2 Hong Kong-like influenza virus was first recognized in July 1968 in Hong Kong and then spread rapidly throughout Southeast Asia. Later, a major epidemic in the United States occurred during the fall and winter of 1968-69. Although localized outbreaks were recorded in most European countries in the winter of 1968-69, the level of activity there did not approach that in the United States. Subsequently, during the winter and spring of 1969, a number of outbreaks were reported from South America, Africa, Australia, and Southeast Asia.

In the fall and winter of 1969-70, the virus reappeared in Europe and Northern Asia causing epidemics of major proportions. In contrast, the United States noted only modest increases above expected levels. For this period, influenza activity was also documented in the Middle East, northern Africa, southern Asia, and the Pacific, and other North American countries. Between June 1969 and March 1970, 42 countries reported outbreaks of influenza to the World Health Organization (Table 6) .

Table 6. Influenza, June 1969 – May 1970

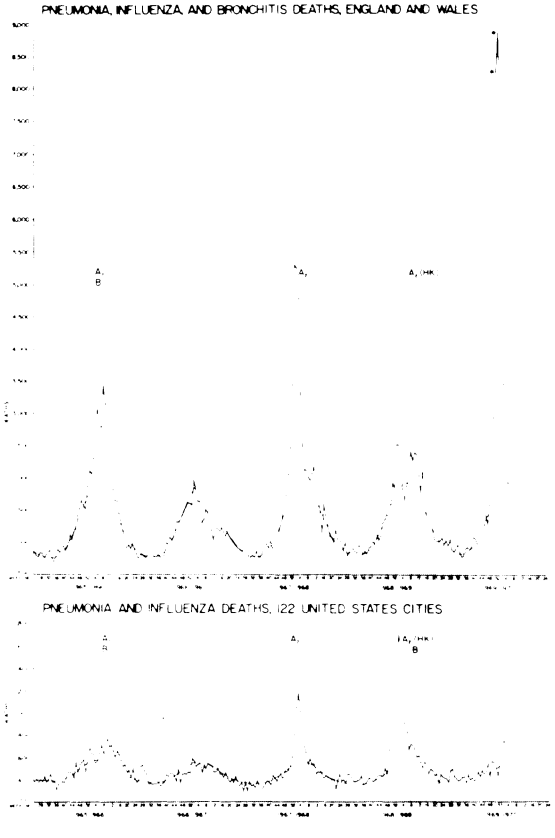
Region	Country	Date of Appearance	Date of Peak Activity	Epidemiologic Data	Virus Isolated
South America	Uruguay		June 69	Widespread with school absenteeism of up to 30% and industrial absenteeism of up to 20%	A2/Hong Kong/68
	Chile		June 69	Primarily involved Santiago and Central Provinces; epidemic proportions in these areas	A2/Hong Kong/68
	Argentina	June 69	July 69	Widespread activity; epidemic; lasted about 18 weeks with two waves; the first caused by A2/Hong Kong virus, the second by B virus	A2/Hong Kong/68 B/Mass/66
Australia Asia	New Zealand	June 69			A2/Hong Kong/68
	Australia		Aug 69	Primarily reported from Melbourne and Sydney	A2/Hong Kong/68
	New Guinea	Sept 69	Sept-Oct 69	Papua Highlands. Severe complications frequent, particularly pneumonia. Over 2,000 deaths reported	A2/Hong Kong/68
	Indonesia	Dec. 69	Dec. 69/Jan. 70	Irian, West Irian. Appearance Dec., peak Dec.-Jan., probably spread from New Guinea. Affected Mindaptana and Sofia, and five places in central highlands. High mortality. Inland more seriously ill as coastal areas	A2/Hong Kong/68
Europe and Northern Asia	Spain	Oct 69	Nov 69	Involved provinces of Madrid, Lugo, Navarra, Barcelona, and Valencia. Attack rates of 15-30%. All age groups affected.	A2/Hong Kong/68
	Portugal	Nov 69		Widespread throughout the country.	A2/Hong Kong/68
	Italy	Nov 69	Dec. 69	Widespread activity. Attack rates estimated 30-40%	A2/Hong Kong/68
	France	Nov 69	Dec. 69	Widespread activity. All age groups affected	A2/Hong Kong/68
	Yugoslavia	Sept 69	Dec. 69	Primarily affecting Zagreb, Croatia, Slovenia, and Belgrade.	A2/Hong Kong/68
	Romania	Nov 69	Dec. 69	Bucharest first later other areas. B virus thought to be primarily responsible. A2/Hong Kong isolated in Jan 70 and responsible for a 2nd country-wide outbreak	B/Mass/66 A2/Hong Kong/68
	United Kingdom	Nov 69	Dec. 69/Jan 70	Widespread throughout, particularly London and Southeast, Midlands and Scotland. Marked increase in respiratory mortality. Scattered cases of Influenza B throughout the country in March and April with several sharp outbreaks in boarding schools	A2/Hong Kong/68 B Mass/66
	Austria	Dec. 69	Dec. 69	Widespread, particularly affecting Karnten, Vienna, Vorarlberg, Upper and Lower Austria, Burgenland, Styria	A2/Hong Kong/68
	W. Germany	Dec. 69	Dec. 69	Widespread activity, mild or moderately severe with a number of deaths. 31% attack rate in Hanover, based on sex-conversion	A2/Hong Kong/68
	Belgium	Dec. 69	Dec. 69	Brussels primarily affected, with a 15% attack rate affecting all age groups	A2/Hong Kong/68
	Bulgaria	Oct 69	Dec. 69	Sofia affected. All age groups involved. B virus primarily responsible, but later a few isolates of A2/Hong Kong and a few localized outbreaks	B/Mass/66 A2/Hong Kong/68
	Greece	Dec. 69	Dec. 69	Clinically mild. 20% attack rate in Athens with all age groups affected	A2/Hong Kong/68
	Denmark	Dec. 69	Dec. 69/Jan. 70	Widespread activity. Clinically mild, but occasionally complicated by pneumonia. Excessive mortality among elderly persons.	A2/Hong Kong/68
	Finland	Dec. 69	Dec. 69/Jan. 70	All areas affected	A2/Hong Kong/68
	Norway				A2/Hong Kong/68
	Sweden	Dec. 69	Jan. 70	Widespread activity. Clinically mild.	A2/Hong Kong/68
	Switzerland	Dec. 69	Jan. 70	Widespread activity	A2/Hong Kong/68
	Netherlands		Jan. 70	Widespread activity	A2/Hong Kong/68
	USSR	Dec. 69		Central, Northwest, and Eastern Regions involved. Primarily due to A2/Hong Kong with some B/Rome/66	A2/Hong Kong/68 B/Rome/66
	Albania	Dec. 69	Jan. 70	Clinically mild. Adults affected primarily	A2/Hong Kong/68
	Czechoslovakia	Dec. 69	Jan. 70	Widespread activity. Clinically mild but with some increased mortality. Overall attack rate approx. 4.2%. Primarily A2/Hong Kong	A2/Hong Kong/68 Influenza B
	Hungary	Dec. 69	Jan. 70	Central, southern and southwestern areas. Absenteeism in Budapest. Mild to moderate severity. Primarily A2/Hong Kong	A2/Hong Kong/68 Influenza B
	Greece	Apr 69	Aug-Sept 69	Clinically mild illness	A2/Hong Kong/68
Africa	Algeria	Jan. 70			A2/Hong Kong/68
	Tunisia	Jan. 70		Namsha primarily affected	A2/Hong Kong/68
Middle East	Israel	Nov 69	Dec. 69	Widespread activity. 20-40% school absentee rates. Early outbreak due to Influenza B, followed due to A2/Hong Kong	A2/Hong Kong/68 Influenza B
	Lebanon	Dec. 69		Isolated cases affected area	A2/Hong Kong/68
	Jordan	Sept 69			A2/Hong Kong/68
Southern Asia and Pacific	Japan	Nov 69		Areas affected: Tokyo, Kanagawa, Yamanashi, Saitama, Chiba, and Tochigi	A2/Hong Kong/68
	Philippines	Dec. 69	Jan. 70		A2/Hong Kong/68
	Fiji	Dec. 69	Dec. 69	Localized outbreak only	A2/Hong Kong/68
	India	Jan.		Regional outbreaks in several states. Clinically mild	A2/Hong Kong/68
	Mexico	Jan. 70		Primarily affected Mexico City with high attack rates	A2/Hong Kong/68
North America	USA	Nov 69	Jan. 70	All 50 states reported activity, but heaviest activity along East Coast, Southeast and Pacific Northwest. Marked excess mortality	A2/Hong Kong/68
	Canada	Jan. 70		Localized outbreaks in New Brunswick, Newfoundland, Nova Scotia, Saskatchewan, Manitoba	A2/Hong Kong/68

The vast majority of the countries reported outbreaks in December 1969 and January 1970, with earlier reports coming primarily from the southern hemisphere. Of the 42 countries, 33 recorded A2 Hong Kong/68-like virus alone; five others had primarily A2 Hong Kong activity with some influenza B involvement. In Argentina, there appeared to be two distinct waves of influenza, the first caused by A2 Hong Kong/68-like influenza virus and the second by Type B influenza virus. England also reported an initial widespread A2 outbreak and later a number of scattered B outbreaks. Israel reported an initial outbreak due to influenza B followed by a

more widespread outbreak of A2 Hong Kong-like virus. Two countries, Romania and Bulgaria, reported the primary agent involved to be influenza B, and both of these countries reported isolated cases and outbreaks of A2 Hong Kong-like influenza virus later in the year, which were less extensive than the initial countrywide outbreaks of influenza B. In most countries, the outbreaks were described as clinically mild, though respiratory disease mortality was generally elevated. All age groups were affected in most of the countries reporting.

The differences in the epidemiologic patterns of occurrence of A2 Hong Kong virus between the United States and the rest of the northern hemisphere can be emphasized by comparing the respiratory mortality data from the U.S. and England (Figure 9). Whereas during the winter of 1968-69, the United States had a sharp peak in respiratory disease mortality, England and Wales noted only localized influenza outbreaks with only modest irregular increases in respiratory disease mortality. This situation completely reversed during the 1969-70 influenza season, with England having a sharp increase and the United States only a modest rise. Particularly striking about the English mortality figures was the abruptness with which the peak was reached and the equally abrupt decline to near baseline levels. Expected baseline levels were first exceeded in the first week of 1970. By the fifth week of 1970, the disease had dropped to baseline levels.

Figure 9



It should be noted, however, that respiratory disease mortality data from the 122 U.S. cities (which report pneumonia-influenza mortality) and England and Wales (which report pneumonia-influenza and bronchitis mortality) are not directly comparable because of differences in the definition of the disease categories, differences in the population base, differences in the age structure of the population, and the

higher British baseline levels, and greater seasonal variation, as well as other factors.

A number of questions remain unanswered about the spread of the Hong Kong A2 influenza variant. Why the United States was so heavily involved during the initial influenza season and the European countries so minimally involved, despite well documented demonstration of the virus, remains unclear. The reversal of the situation during the 1969-70 season might have been predicted on the basis of population immunity and susceptibility.

V. LABORATORY NOTES

The results of reciprocal hemagglutination inhibition (HI) tests comparing recent (July 1969 through June 1970) Influenza A2 isolates with reference strains from earlier years are shown in Table 7. The HI titers are geometric means of duplicate tests with RDE-treated chicken sera and allantoic fluid antigens. Recent isolates were selected to represent worldwide geographic locations and include strains from England, Hawaii, Taiwan, New Guinea, and North, South and Central America.

Table 7. Reciprocal Hemagglutination Inhibition*: Type A2 Influenza Viruses, 1957-1970

Antisera**	Antigen	A2 Japan/305/57	A2 Taiwan 1/64	A2 Tokyo/3/67	A2 Victoria/4/68	A2 Korea/426/68	A2/Netherlands/84/68	A2/Hong Kong/8/68	A2 Caracas 3/69	A2/Chile/487/69	A2 Colombia 1/69	A2 Cordoba 963/69	A2 England/878/69	A2 Hawaii 1/69	A2 New Guinea 1/69	A2/Puerto Rico/1/69	A2 Alaska 10/269	A2/Taiwan/1/69	A2 Washington/102/69	A2 Ann Arbor 1/70	A2 Georgia 2/70	A2 Illinois 1/70	A2 Mexico 1/70	A2 New York City 1/70	A2 Texas 1/70
Jap/305		320	80	40	40	160	113	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taiwan/64		113	905	40	80	640	57	0	0	10	10	0	0	0	0	0	0	0	10	10	10	0	0	10	14	0
Tokyo		28	57	1280	640	113	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria		160	640	905	5120	453	320	14	0	0	10	0	10	0	0	0	0	0	0	0	0	0	0	0	14	0
Korea		160	905	160	226	1280	160	20	0	10	10	0	10	0	10	0	0	14	10	10	0	0	10	10	0
Nederlands		160	80	80	113	160	453	40	20	28	40	20	40	28	20	20	20	28	40	28	20	20	28	57	20
Hong Kong		40	28	0	10	28	20	640	320	320	640	226	160	320	320	320	320	320	640	453	160	320	320	640	320
Caracas		57	40	0	10	40	20	453	453	453	1810	640	453	640	1280	905	905	905	640	1810	320	640	905	1280	640
Chile		320	226	0	57	320	113	640	453	453	905	640	640	640	1280	1280	1280	640	905	905	320	640	905	905	640
Colombia		226	113	0	28	160	160	640	905	905	2560	640	453	1280	1810	1280	1280	1280	905	1810	640	640	2560	1810	1280
Cordoba		20	20	0	14	28	10	320	320	226	640	453	160	320	453	453	453	640	320	640	320	320	320	640	320
England		40	20	0	14	40	80	320	320	226	453	160	453	320	320	320	453	320	320	453	160	320	453	640	453
Hawaii		20	14	0	0	20	10	113	113	113	320	160	80	160	160	160	226	226	160	226	160	160	226	453	113
New Guinea		160	57	0	14	80	80	640	453	905	1810	640	226	905	640	905	905	905	1280	1280	453	905	1810	2560	905
Puerto Rico		40	28	0	10	20	14	113	113	113	320	160	160	226	226	226	160	226	226	226	160	160	226	320	160
Alaska		40	14	0	0	20	20	905	905	905	1280	640	320	1280	905	640	905	905	1280	1810	640	640	905	905	640
Taiwan/69		80	57	20	10	113	57	453	226	226	640	226	226	226	320	226	453	453	320	453	226	320	320	905	320
Washington		57	28	0	0	40	28	1280	453	640	1810	226	640	905	640	640	1280	1280	1810	1280	320	640	640	2560	453
Ann Arbor		40	20	0	0	40	14	453	453	453	1280	226	226	453	320	453	453	905	453	640	226	320	453	905	453
Georgia		57	20	0	10	28	113	1280	453	640	1280	226	320	905	640	640	640	905	905	640	320	640	905	905	453
Illinois		226	113	0	20	160	160	1280	640	905	2560	905	453	3620	1810	640	1280	1280	1280	2560	640	1280	3620	1810	3620
Mexico		226	80	0	57	160	113	1280	453	640	2560	453	453	905	1280	640	640	905	905	905	320	640	905	905	640
New York City		20	0	0	10	40	40	640	453	453	1280	453	226	640	905	640	1810	905	905	905	320	453	905	905	320
Texas		40	28	0	0	40	10	640	453	640	1280	320	453	905	640	226	1280	1280	905	1280	320	453	905	905	640

*Geometric mean HI titers of duplicate tests. 0 = <10

**Chicken antisera treated with receptor destroying enzyme.

Based on HI test results there is no evidence of any significant antigenic change in the Hong Kong-like strains isolated since 1968. The antigenic relationships of the Hong Kong-like strains to each other and to the earlier A2 viruses remain the same. That is, all pre-Hong Kong strains, except Tokyo/3/67, were inhibited to some extent by sera against the Hong Kong variants, but antisera against the pre-Hong Kong strains only rarely inhibited hemagglutination by the Hong Kong-like variants.

The A2/Nederlands/85/68 strain that was isolated by Dr. N. Masurel (Leiden) prior to the emergence of the Hong Kong variant is a major exception to the usual antigenic pattern. Although it is generally more closely related to the pre-Hong Kong strains, the Nederlands isolate shows some degree of reciprocal reactivity with every strain isolated. The contribution, if any, of the neuraminidase to the unusual patterns exhibited by this virus is now under investigation. The Nederlands strain appears to exemplify the transitional or bridging strains referred to by Fazekas de St. Groth (Bull. WHO 41, 1969).

Similarity coefficients, calculated according to the method of Archetti-Horsfall, and phenograms, based on clustering by average similarity correlation coefficients, have also been prepared in an attempt to simplify analysis of the data shown in Table 7. The close antigenic relationships in the Hong Kong-like strains and their divergence from previous A2 strains are clearly illustrated by both the similarity coefficients (Table 8) and the phenogram (Figure 10). The broad reactivity of the A2/Nederlands strain and, to a lesser extent, the A2/Korea strain also becomes more apparent from the similarity coefficients (Table 8).

Table 8 Strain Relationships of Type A2 Influenza Viruses
(Similarity coefficients according to the formula of Archetti and Horsfall, JEM *92* 441, 1950)

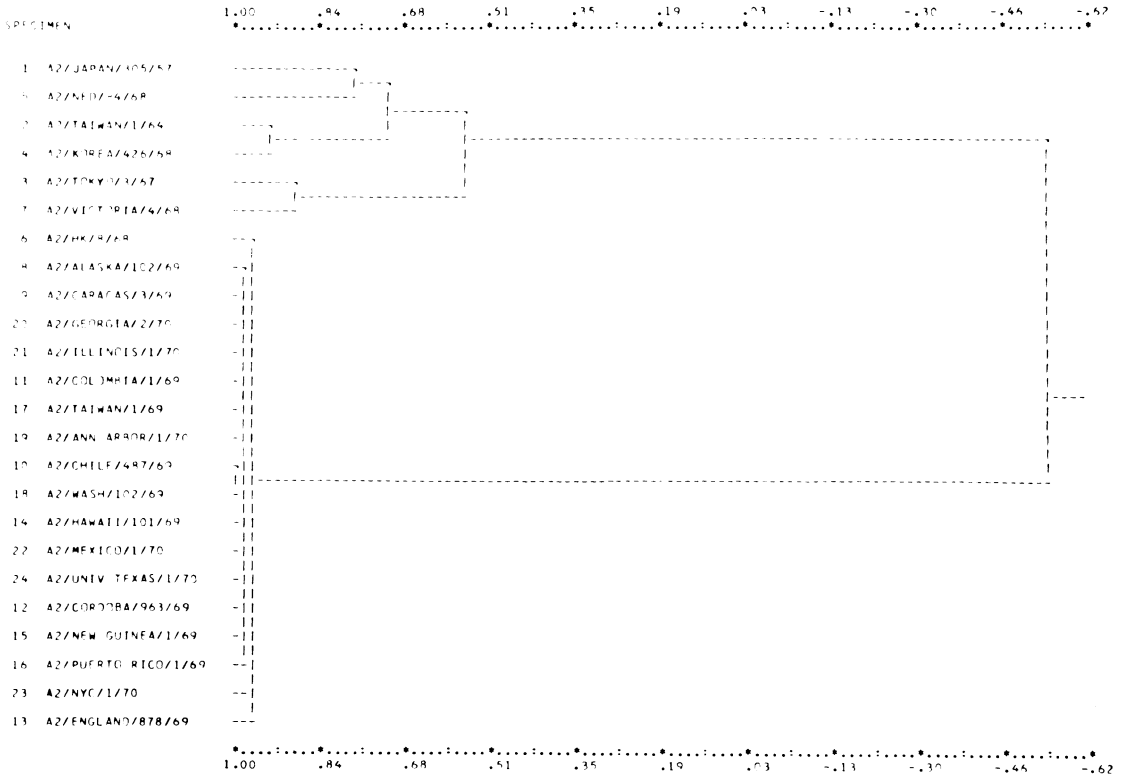
To find the coefficient of similarity between 2 strains, trace down the vertical column of one strain to its intersection with the horizontal row of the other. i = indeterminate

A2/Japan/305/57	A2/Taiwan/1/64	A2/Tokyo/3/67	A2/Victoria/4/68	A2/Korea/426/68	A2/Ned/84/68	A2/Hong Kong/8/68	A2/Canada/1/69	A2/Chile/4457/69	A2/Colombia/1/69	A2/Cordoba/98/69	A2/England/378/69	A2/Hawaii/101/69	A2/New Guinea/1/69	A2/Puerto Rico/1/69	A2/Alaska/102/69	A2/Taiwan/1/69	A2/Washington/102/69	A2/Ann Arbor/1/70	A2/Georgia/2/70	A2/Illinois/1/70	A2/Mexico/1/70	A2/New York City/1/70	A2/New Jersey/1/70
6																							
19	23																						
16	10	3																					
4	1	10	8																				
3	10	11	8	5																			
23	54	i	152	38	19																		
i	i	i	i	i	23	1																	
i	13	i	i	13	8	1	1																
23	45	i	215	45	13	2	1	1															
i	i	i	i	i	32	2	1	1	2														
23	54	i	128	38	8	2	1	1	2	3													
19	38	i	i	38	16	2	1	1	1	1	2												
i	i	i	i	32	13	1	1	1	1	1	2	1											
i	32	i	i	45	19	2	1	1	1	1	1	1	1										
i	i	i	i	i	32	1	1	1	1	1	2	1	1	1									
i	27	i	i	19	11	1	1	1	1	1	2	1	1	1	1								
i	76	i	i	76	27	1	2	1	2	3	2	1	1	2	1	1							
23	54	i	i	45	27	1	1	1	1	1	2	1	1	1	1	1	1						
i	i	i	i	i	8	1	1	1	1	1	2	1	1	1	1	1	1	1					
i	i	i	i	i	13	1	1	1	1	1	2	1	1	2	1	1	2	1	1				
13	32	i	i	27	11	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1			
27	i	i	i	54	13	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1		
i	i	i	i	i	38	1	1	1	1	2	1	1	1	2	1	1	2	1	1	1	1	1	

However, it should be recognized that these methods of presentation, while useful, have significant limitations. For example, whereas both methods define antigenic relationships in terms of distance, they provide no information regarding the symmetry of relationships. "One-way" antigenic crosses, asymmetrical relationships or junior-senior relationships as described by Fazekas de St. Groth (Bull. WHO 41, 1969) are obscured. Also, the bridging properties of strains like A2/Nederlands/84/68 and A2/Korea/426/68 are not seen in two-dimensional phenograms (Figure 10).

FIGURE 10

CLUSTERING BY AVERAGE SIMILARITY
CORRELATION COEFFICIENTS
24 INFLUENZA A2 STRAINS--G. MEAN



Influenza B activity was limited in the Western Hemisphere for this period. The few isolated recovered were still quite similar to the B/Massachusetts/3/66 strain.

RECOMMENDATION OF THE PUBLIC HEALTH SERVICE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES

INFLUENZA VACCINE

INTRODUCTION

Influenza, a common respiratory illness occurring in the United States each year, appears periodically in epidemic form. Epidemic periodicity is thought to result from antigenic variations in the prevalent influenza viruses and from the proportion of susceptible and immune individuals in the population. The probability of an epidemic in any year depends to a considerable degree upon the extent of recent influenza in the community and the extent of antigenic change in the prevalent influenza viruses.

Inactivated influenza vaccines* have been variably effective and have offered rather brief periods of protection. Control of epidemic influenza in the general population is therefore not possible through routine vaccination.

Still, influenza vaccines are our best available preventives of influenza. Their SELECTIVE use can be readily justified for chronically ill patients of all ages and for older persons in the population. Individuals in both groups are characteristically at greatest risk of serious complications or death from influenza or its complications.

Previous recommendations for using influenza vaccine have incorporated forecasts of expected influenza activity in the coming year. These forecasts may have led to the misunderstanding that vaccines should be employed only in years when epidemics are predicted. It should be emphasized that some influenza A or B cases occur in the United States each year, although their frequency and geographic extent may vary widely. Annual vaccination of all individuals for whom influenza would be a significant hazard is recommended regardless of the expected occurrence of influenza in any area.

INFLUENZA VIRUS VACCINES

The Division of Biologics Standards, National Institutes of Health, regularly reviews influenza vaccine formulation and, when indicated, recommends revisions to include contemporary antigens. Strains of influenza A examined in the United States and abroad in 1969-70 did not differ significantly from the Hong Kong strain, A2 Aichi 2/68. For 1970-71, the composition of the vaccine will remain the same as the bivalent vaccine recommended for 1969-70. The adult dose of inactivated influenza vaccine will contain 400 chick cell agglutinating (CCA) units of type A2 antigen (A2 Aichi 2/68) and 300 CCA units of type B antigen (B/Mass/3/66).

Highly purified vaccines will be available from most manufacturers. These highly purified vaccines are equivalent in potency to earlier vaccines, but contain less nonviral protein and are the recommended products where available.

RECOMMENDATIONS

Annual vaccination is recommended for persons of all ages who have chronic debilitating conditions: 1) congenital and rheumatic heart disease, especially mitral stenosis; 2) cardiovascular disorders such as arteriosclerotic and hypertensive heart disease, particularly with evidence of cardiac insufficiency; 3) chronic bronchopulmonary diseases, such as asthma, chronic bronchitis, cystic fibrosis, bronchiectasis, emphysema, and advanced tuberculosis; or 4) diabetes mellitus and other chronic metabolic disorders.

Candidates for influenza vaccine who have had severe local or systemic reactions to the vaccine in the past may experience less discomfort if the highly purified vaccine is used.

Although the indications for vaccination of all older persons are less clear, older persons who may have incipient or potential chronic disease, particularly those affecting cardiovascular and bronchopulmonary systems, should also be considered candidates for annual vaccination.

Immunization of persons involved in providing essential community services may also be considered. However, before embarking upon such a program, physicians responsible for such groups must take into account a number of factors including: the difficulties inherent in prediction of influenza epidemics, the variability of vaccine effectiveness, the incidence of side reactions, the cost of the programs, the availability of the vaccine, and the diversion of existing vaccine supplies from those with chronic debilitating conditions who are at high risk.

VACCINATION SCHEDULE

The primary series consists of 2 doses administered subcutaneously, preferably 6 to 8 weeks apart. (Dose volume for adults and a detailed schedule for children is specified in the manufacturers' labeling.) Persons who had 1 or more doses of the vaccine containing Hong Kong strain antigen in the 1968-69 or the 1969-70 seasons require only a single subcutaneous booster dose of bivalent vaccine. All others should receive a primary series. Vaccination should be scheduled for completion by mid-November.

PRECAUTIONS

Influenza vaccine is prepared from viruses grown in embryonated eggs and ordinarily should not be administered to persons hypersensitive to ingested or injected egg protein.

*The official name of the currently available product is Influenza Virus Vaccine, Bivalent.

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STATE EPIDEMIOLOGISTS AND STATE LABORATORY DIRECTORS

Key to all disease surveillance activities are the physicians who serve as State epidemiologists. They are responsible for collecting, interpreting, and transmitting data and epidemiological information from their individual States; their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors, we are indebted to them for their valuable support.

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